PB-237 613

BACKGROUND INFORMATION FOR STANDARDS OF PERFORMANCE

PRIMARY ALUMINUM INDUSTRY. VOLUME 2. TEST DATA SUMMARY

ENVIRONMENTAL PROTECTION AGENCY

OCTOBER 1974

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This volume is the first of a series on standards of performance for primary aluminum plants. This volume presents the proposed standards and the rationale for the degree of control selected. The volume also discusses the analytical methods for sampling emissions and the environmental and economic impact of the standards.

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BACKGROUND INFORMATION FOR STANDARDS OF PERFORMANCE: PRIMARY ALUMINUM INDUSTRY VOLUME 2: TEST DATA SUMMARY

Emission Standards and Engineering Division

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

October 1974

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PRIMARY ALUMINUM INDUSTRY

INTRODUCTION

This document presents a summary of source tests and visible emission measurements cited in "Technical Report: An Investigation of the Best Systems of Emission Reduction for the Primary Aluminum Industry." It is concerned principally with tests for fluorides and visible emissions, but also describes the facilities from which data have been obtained, their operating conditions, and characteristics of exhaust gas streams.

Facilities are identified by the same coding used in the Technical Report (except as noted in the facility descriptions). For example, Table 1 (Facility A_1) summarizes results of EPA's May 1972 measurements of primary emissions from Plant A. These same results are also plotted in Figure 11 of the Technical Report identified as Plant A_1.

Many of the tests summarized herein were conducted using EPA Method 13 for fluorides. This method will be proposed in the Federal Register at the time of proposal of standards of performance for new or substantially modified primary aluminum plants.

Fluoride Test Results

A program was undertaken by EPA to evaluate the best control techniques available for controlling fluoride emissions from primary aluminum plants. The data obtained serves as input to development of standards of performance for primary aluminum plants being proposed under section 111 of the Clean Air Act of 1970.

Preliminary investigation revealed the locations of a number of reportedly well controlled plants. Eight of these were visited to obtain further information on the process and air pollution control equipment. Six plants were selected for emission tests. These plants represented all three types of reduction cells and a variety of air pollution control systems. Two of these plants were later retested. Two other plants were inspected in Europe, and emission data was furnished by their owners. Additional data was obtained from American aluminum companies and from state air pollution control agencies.

Figures 1, 2, and 3 present a visual comparison of the data.

Facilities

Potroom Facilities

A. Plant A is a vertical stud Soderberg plant with a production capacity of 88,000 tons per year of aluminum. The plant has two pot lines with 150 cells (pots) per line housed in four potrooms. The primary emission control system consisted of a "bubbler" scrubber followed by a wet

electrostatic precipitator. The secondary system consisted of a spray screen scrubber at the roof monitors. The primary emissions were tested twice by an EPA contractor (tests A_1 and A_2) using EPA Method 13 for fluorides. Additional primary emission data, results of emission measurements performed by the company, were furnished by a state agency (A_3). Secondary emissions were tested by EPA contractors three times. Tests A_1 and A_2 were performed in conjunction with the respective primary emission tests A_1 and A_2, while test A was performed on a separate occasion. Additional secondary emission data from company tests was provided by a state agency (A_3) and by the company itself (A_4). EPA Method 13 was used for tests A and A_2 of secondary emissions. Company test methods were used for the other secondary emission tests.

B. This is a horizontal stud Soderberg plant with a production capacity of 190,000 tons per year of aluminum. The newer portion of the plant tested consisted of three potlines with 168 cells per line housed in six potrooms. The primary emission control system used at this plant consisted of a venturi scrubber using a caustic solution, so that the fluoride can be recovered, followed by a wet electrostatic precipitator. The plant did not use a control system for secondary emissions. Primary and secondary emissions were both tested at this plant by an EPA contractor using EPA Method 13 (tests designated B). Additional data on primary and secondary emissions (designated B_1) were provided by the company. The test method used by the company is not known.

C. This is a prebake plant with a production capacity of 175,000 tons per year of aluminum. Aluminum is produced from five potlines with about 156 cells per line. The primary emission control system used on the potroom tested was a fluid bed dry scrubber using alumina as the scrubbing medium and a baghouse as the collector. The plant did not use a control system for secondary emissions. Primary and secondary emissions were both tested at this plant using EPA Method 13.

D. This is a prebake plant with a production capacity of about 120,000 tons per year of aluminum. Aluminum is produced from two potlines containing 124 cells per line. The potlines are housed in four potrooms. The primary emission control system used on the potroom tested was a fluid bed dry scrubber using alumina as the scrubbing medium and a baghouse as the collector. The plant did not use a control system for secondary emissions. Primary emissions were tested twice by EPA (tests designated D and D_1) and secondary emissions were tested once. EPA Method 13 was used to conduct all tests. Visible emission data for both primary and secondary emissions were obtained by EPA and contractor personnel using EPA Method 9 on another occasion.

E. These data are not specific to any one plant, but are primary and secondary emission data provided by the owner of Facilities C and D. Tests were conducted using the company's own test method.

F. This is a European vertical stud Soderberg plant which produces about 25,000 metric tons of aluminum per year. Aluminum is produced from one potroom containing 88 cells. The primary emission control system consists of cyclones in series with fluid bed dry scrubbers using alumina as the scrubbing medium and baghouses as collectors. Secondary emissions are controlled by scrubbing towers using sea water as the scrubbing medium. Gas from the primary control system is also routed through the secondary system scrubbers. Both primary and secondary control systems were tested by the owner of the plant. Only primary emission data are utilized. Test methods are unknown.

G. This is a European plant using prebake cells which produces about 80,000 metric tons of aluminum per year from 216 cells. A dry primary emission control system is used. There is no secondary emission control system. Both primary and secondary emission data were provided by the owner. Test methods are unknown. (Secondary emission data for this facility is coded as "Plant F" in Figure 12 of the Technical Report.)

H. This plant uses prebake cells and produces 265,000 tons of aluminum per year. The primary control system is an injected alumina dry scrubber. Secondary control is by a powered concurrent spray scrubber. Both primary and secondary emission data was submitted by a state air pollution control agency. The test method is unknown. (Secondary emission data for this facility is coded as "Plant G" in Figure 12 of the Technical Report.)

Anode Plants

A. This plant started production late in 1970 and has a production capacity of about 75,000 tons per year of anodes. Anodes are produced by crushing and sizing the raw material, coke, and mixing it with pitch (tar). The anode blocks are produced in a hydraulic unit which presses the coke-tar mixture into blocks. The blocks are then placed in the anode furnace to bake for about 30 days at 1100-1200°C. The emissions from the anode bake furnace are collected in two parallel 54-inch ducts which are each connected to a water spray tower and electrostatic precipitators in series. The water spray towers condense much of the tar in the gases and closely controls the temperature of the gases entering the electrostatic precipitator. After the spray towers and precipitators, the gas stream is combined and is discharged from a 2.7 meter (nine-foot) diameter, 53 meter (175 feet) high stack. This facility was tested by EPA using Method 13 for fluorides. Visible emission data were obtained using EPA Method 9 by EPA and contractor personnel on a separate occasion.

B. This plant started production of anodes in 1971 with a production capacity of about 230,000 tons per year of anodes. Anodes are produced by crushing and sizing the raw material, coke, which is then mixed with pitch (tar). The anode blocks are produced in a vibrator unit which compacts the coke-tar mixture into blocks. The blocks are then placed in the anode furnace to bake for about

30 days at 1150-1200°C. The emissions from the anode furnace are collected in two 54-inch ducts which join together at a water spray conditioning chamber. The chamber condenses much of the tar and provides close temperature control of the gas stream entering the electrostatic precipitator. The gas discharges through a 30 meter (100 foot) stack. This facility was tested by EPA contractors using EPA Method 13.

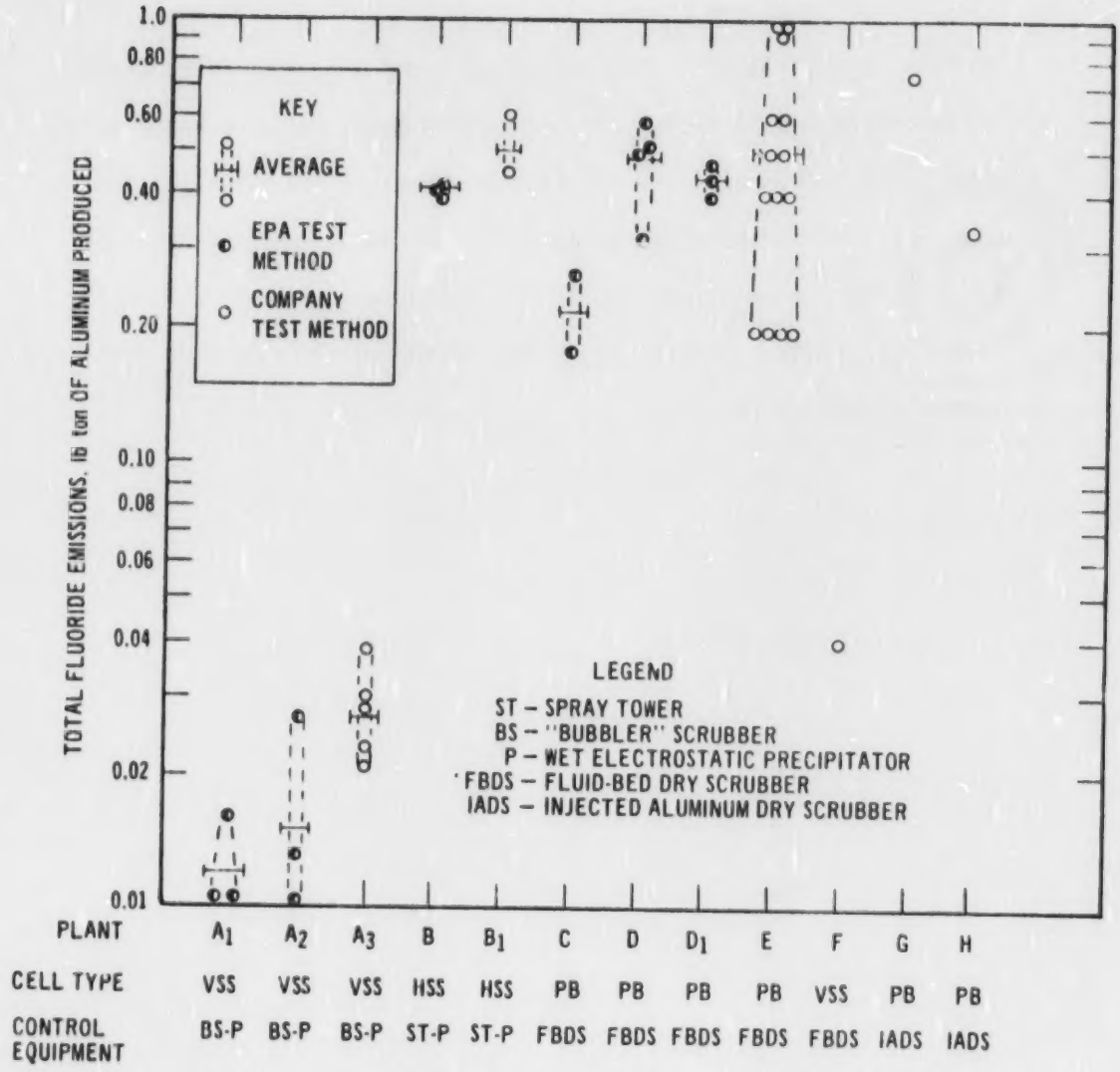


Figure 1. Primary emissions from the primary aluminum reduction industry.

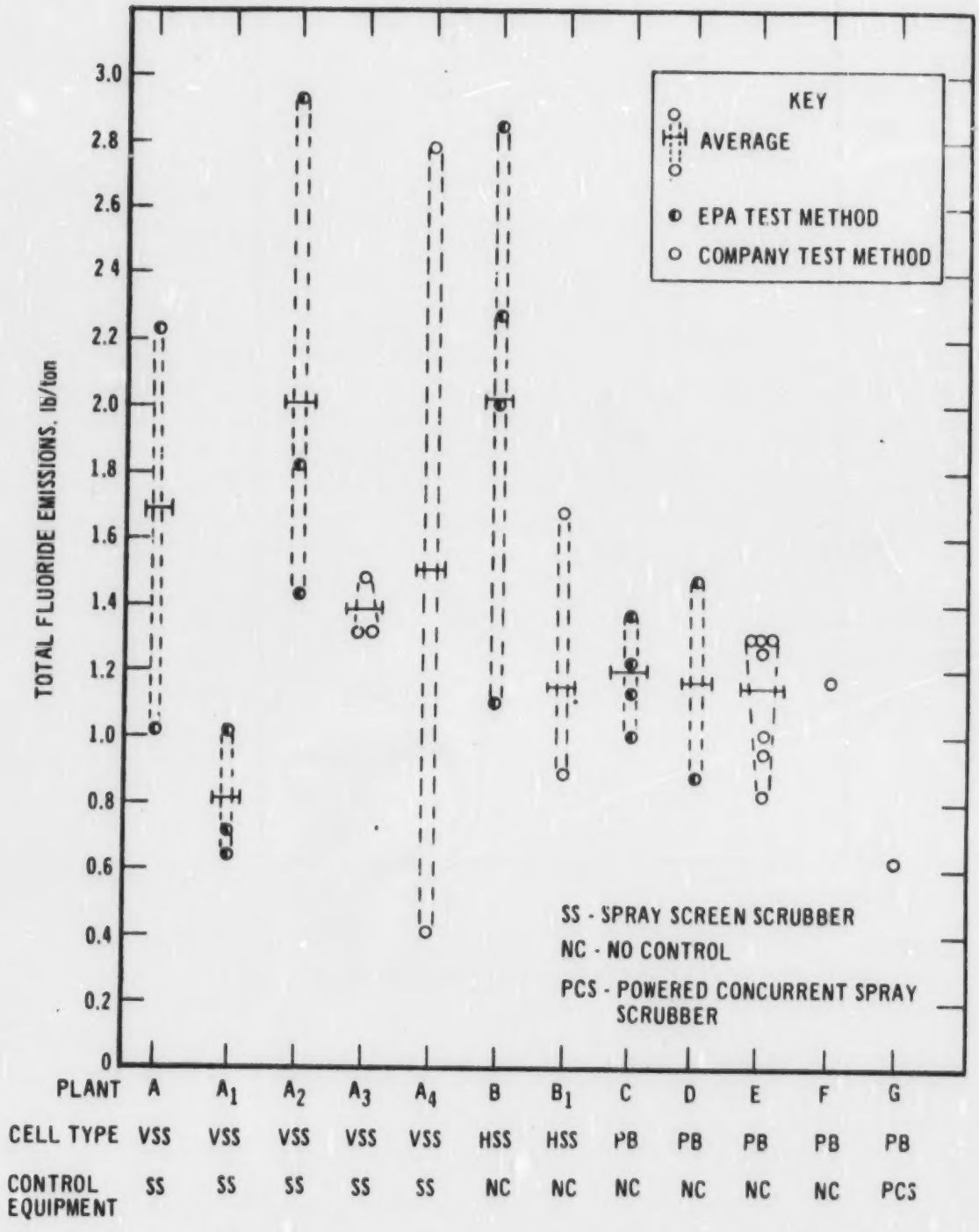


Figure 2. Secondary emissions from the primary aluminum reduction industry.

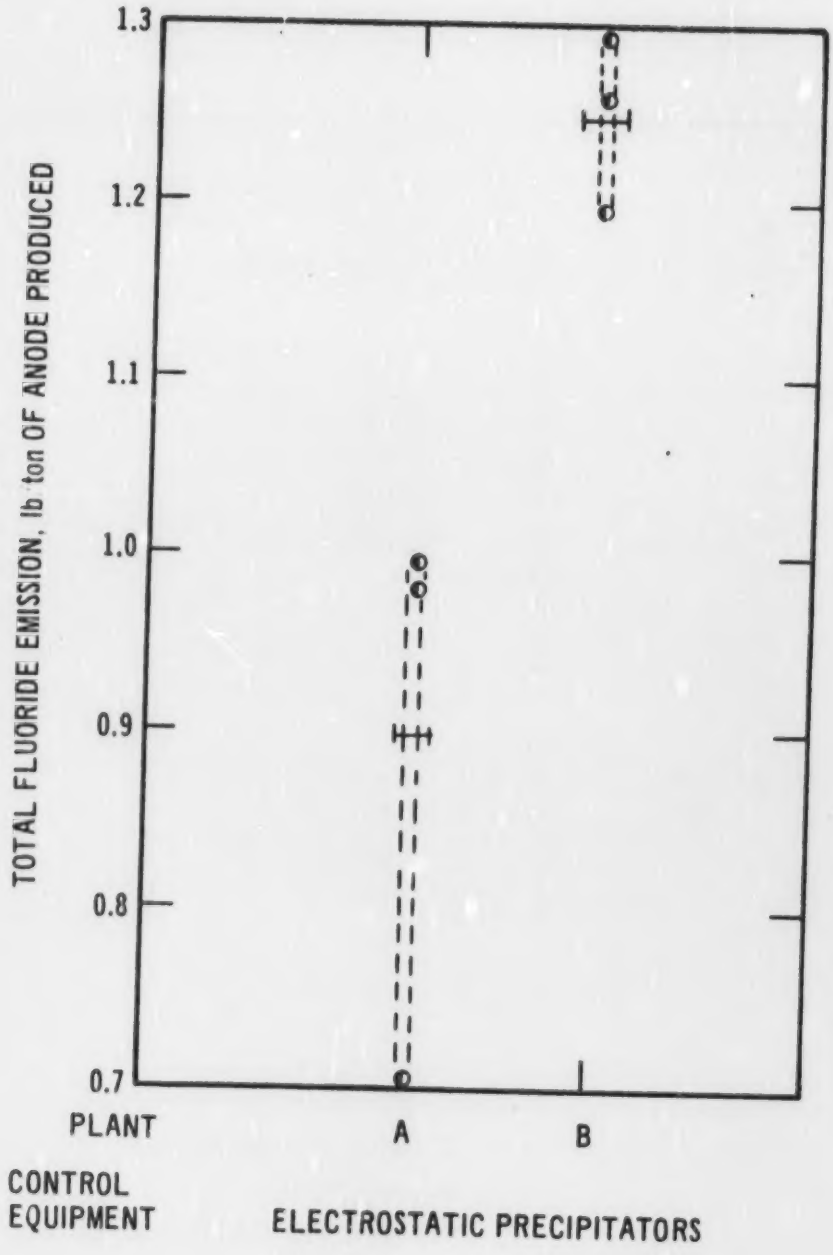


Figure 3. Carbon anode bake plant emissions.

Table 1

FACILITY - A_1 (Primary Outlet - Fluorides)

Summary of Results

Run number	1	2	3	Average
Date	5/8/72	5/9/72	5/9/72	-
Test Time-minutes	288	288	288	288
Production rate - TPH	0.512	0.512	0.512	0.512
Stack Effluent				
Flow rate - DSCFM	5758.0	5999.8	5114.7	5324.2
Flow rate - DSCF/ton	663,000	586,000	588,000	612,333
Temperature - ^oF	52.0	52.2	51.7	52.0
Water vapor - Vol. %	2.38	2.65	2.60	2.51
CO_2 - Vol. % dry	6.0	6.0	6.0	6.0
O_2 - Vol. % dry	15.5	15.5	15.5	15.5
CO - Vol. % dry	0.0	0.0	0.0	0.0
Visible Emissions - % opacity	5%	5%	5%	5%
Fluorides				
Soluble				
gr/DSCF	0.000145	0.000118	0.000124	0.000129
gr/ACF	0.000147	0.000120	0.000125	0.000131
lb/hr	0.00715	0.00516	0.00535	0.00587
lb/ton of product	0.0140	0.0101	0.0104	0.0115
Total Fluorides				
gr/DSCF	0.000167	0.000118	0.000124	0.000136
gr/ACF	0.000170	0.000120	0.000125	0.000138
lb/hr	0.00825	0.00516	0.00535	0.000625
lb/ton of product	0.0161	0.0101	0.0104	0.0122

Reference 1.

Table 2

FACILITY - A_2 (Primary Outlet - Fluorides)

Summary of Results

Run number	1	2	3	Average
Date	10/2-3/72	10/3-4/72	10/4-5/72	-
Test Time-minutes	1442	1440	1080	1321
Production rate - TPH	0.516	0.516	0.516	0.516
Stack Effluent				
Flow rate - DSCFM	3929	4705	5187	4607
Flow rate - DSCF/ton	7614	9188	10052	8928
Temperature - ^{o}F	81	81	80	81
Water vapor - Vol. %	3.3	3.2	3.5	3.3
CO_2 - Vol. % dry	6.0	6.0	6.0	6.0
O_2 - Vol. % dry	15.5	15.5	15.5	15.5
CO - Vol. % dry	0.0	0.0	0.0	0.0
Visible Emissions - % opacity	0-5	0-5	0-5	0-5%
Fluorides				
Soluble				
gr/DSCF	0.000084	0.00016	0.00027	0.00017
gr/ACF	0.000080	0.00015	0.00026	0.00016
lb/hr	0.0028	0.0068	0.0128	0.0075
lb/ton of product	0.0060	0.013	0.025	0.015
Total Fluorides				
gr/DSCF	0.000087	0.00016	0.00029	0.00018
gr/ACF	0.000082	0.00016	0.00028	0.00017
lb/hr	0.0030	0.0069	0.014	0.0079
lb/ton of product	0.0006	0.013	0.027	0.016

Reference 2.

Table 3

FACILITY A_3 (Primary Outlet-Fluorides)

Summary of Results

Run Number	1	2	3	4	5	Average
Date	3/9/72	3/14/72	3/15/72	3/16/72	3/17/72	--
Test Time-minutes	--	--	--	--	--	--
Production rate - TPH	--	--	--	--	--	--
Stack Effluent						
Flow rate - DSCFM	--	--	--	--	--	--
Flow rate - DSCF/ton	--	--	--	--	--	--
Temperature - °F	--	--	--	--	--	--
Water vapor - Vol.%	--	--	--	--	--	--
CO_2 - Vol.% dry	--	--	--	--	--	--
O_2 - Vol.% dry	--	--	--	--	--	--
CO - Vol.% dry	--	--	--	--	--	--
Visible Emissions - % opacity	--	--	--	--	--	--
Fluorides						
Soluble						
gr/DSCF	--	--	--	--	--	--
gr/ACF	--	--	--	--	--	--
lb/hr	--	--	--	--	--	--
lb/ton of product	--	--	--	--	--	--
Total Fluorides						
gr/DSCF	0.000195	0.000236	0.000268	0.000302	0.000385	0.000277
gr/ACF	--	--	--	--	--	--
lb/hr	--	--	--	--	--	--
lb/ton of product	0.020	0.023	0.0275	0.030	0.039	0.028

Reference 3.

Table 4

FACILITY - A (Secondary Outlet - Fluorides)

Summary of Results

Run number	1	2	3	Average
Date	11/8/71	11/9/71	11/9/71	-
Test Time-minutes	180	180	180	180
Production rate - TPH	0.256	0.256	0.256	0.256
Stack Effluent				
Flow rate - DSCFM	139,200	139,200	139,200	139,200
Flow rate - DSCF/ton	32,630,000	32,630,000	32,630,000	32,630,000
Temperature - ^{o}F	50	50	53	51
Water vapor - Vol. %	1.337	1.006	1.922	1.088
CO_2 - Vol. % dry	0.0	0.0	0.0	0.0
O_2 - Vol. % dry	20.5	20.6	20.6	20.6
CO - Vol. % dry	0.02	0.03	0.03	0.027
Visible Emissions - % opacity	5-10%	5-10%	5-10%	5-10%
Fluorides				
Soluble				
gr/DSCF	0.00014	0.00043	0.00041	0.00033
gr/ACF	0.00014	0.00044	0.00041	0.00033
lb/hr	0.168	0.512	0.485	0.388
lb/ton of product	0.66	2.00	1.89	1.52
Total Fluorides				
gr/DSCF	0.00023	0.00800	0.00049	0.00291
gr/ACF	0.00023	0.00810	0.00049	0.00294
lb/hr	0.273	9.52	0.572	3.455
lb/ton of product	1.07	37.20*	2.24	26.26* (1.65)

* Sample not consistent with normal range, probable picked up particulate F during sample handling. Probable average shown in parenthesis.

Table 5

FACILITY - A_1 (Secondary Outlet - Fluorides)

Summary of Results

Run number	1	2	3	Average
Date	5/8/72	5/9/72	5/9/72	-
Test Time-minutes	300	300	280	293.3
Production rate - TPH	0.256	0.256	0.256	0.256
Stack Effluent				
Flow rate - DSCFM	251,970	251,970	251,970	251,970
Flow rate - DSCF/ton	59,000,000	59,000,000	59,000,000	59,000,000
Temperature - ^oF	50	60	60	63.3
Water vapor - Vol. %	1.34	1.40	0.995	1.24
CO_2 - Vol. % dry	6.0	6.0	6.0	6.0
O_2 - Vol. % dry	15.5	15.5	15.5	15.5
CO - Vol. % dry	0.0	0.0	0.0	0.0
Visible Emissions - % opacity	5-10%	5-10%	5-10%	5-10%
Fluorides				
Soluble				
gr/DSCF	0.00084	0.000122	0.000065	0.000090
gr/ACF	0.000087	0.000123	0.000066	0.000092
lb/hr	0.182	0.263	0.141	0.195
lb/ton of product	0.711	1.026	0.551	0.762
Total Fluorides				
gr/DSCF	0.000084	0.000126	0.000076	0.000095
gr/ACF	0.000087	0.000128	0.000077	0.000097
lb/hr	0.182	0.273	0.165	0.207
lb/ton of product	0.711	1.066	0.643	0.806

Reference 1.

Table 6

FACILITY - A_2 (Secondary Outlet - Fluorides)

Summary of Results

Run number	1	2	3	Average
Date	10/2-3/72	10/3-4/72	10/4-5/72	-
Test Time-minutes	1440	1440	1440	1440
Production rate - TPH	0.258	0.258	0.258	0.258
Stack Effluent				
Flow rate - DSCFM	253,000	255,100	261,000	256,700
Flow rate - DSCF/ton	59,000,000	59,300,000	61,100,000	59,800,000
Temperature - ^oF	74	71	64	70
Water vapor - Vol. %	2.0	1.9	1.5	1.8
CO_2 - Vol. % dry	6.0	6.0	6.0	6.0
O_2 - Vol. % dry	15.5	15.5	15.5	15.5
CO - Vol. % dry	0.0	0.0	0.0	0.0
Visible Emissions - % opacity	0-5%	0-5%	0-5%	0-5%
Fluorides				
Soluble				
gr/DSCF	0.00032	0.00017	0.00020	0.00023
gr/ACF	0.00031	0.00016	0.00020	0.00022
lb/hr	0.703	0.363	0.450	0.505
lb/ton of product	2.73	1.4.	1.74	1.96
Total Fluorides				
gr/DSCF	0.00035	0.00017	0.00021	0.00027
gr/ACF	0.00034	0.00016	0.00021	0.00025
lb/hr	0.757	0.367	0.468	0.531
lb/ton of product	2.93	1.42	1.81	2.05

Reference 2.

Table 7

FACILITY A_3 (Secondary Outlet-Fluorides)

Summary of Results

Run number	1	2	3	Average
Date	3/10/72	3/14/72	3/16/72	--
Test Time-minutes	--	--	--	--
Production rate - TPH	--	--	--	--
Stack Effluent				
Flow rate - DSCFM	--	--	--	--
Flow rate - DSCF/ton	--	--	--	--
Temperature - ^oF	--	--	--	--
Water vapor - Vol. %	--	--	--	--
CO_2 - Vol. % dry	--	--	--	--
O_2 - Vol. % dry	--	--	--	--
CO - Vol. % dry	--	--	--	--
Visible Emissions - % opacity	--	--	--	--
Fluorides				
Soluble				
gr/DSCF	--	--	--	--
gr/ACF	--	--	--	--
lb/hr	--	--	--	--
lb/ton of product	--	--	--	--
Total Fluorides				
gr/DSCF	0.000193	0.000169	0.000170	0.000177
gr/ACF	--	--	--	--
lb/hr	--	--	--	--
lb/ton of product	1.49	1.31	1.31	1.37

Reference 3.

Table 8

FACILITY A_4 (Secondary Outlet-Fluorides)

Summary of Results

	Average*
Run number	--
Date	--
Test Time-minutes	--
Production rate - TPH	--
Stack Effluent	
Flow rate - DSCFM	--
Flow rate - DSCF/ton	--
Temperature - ^oF	--
Water vapor - Vol. %	--
CO_2 - Vol. % dry	--
O_2 - Vol. % dry	--
CO - Vol. % dry	--
Visible Emissions - % opacity	--
Fluorides	
Soluble	
gr/DSCF	--
gr/ACF	--
lb/hr	--
lb/ton of product	--
Total Fluorides	
gr/DSCF	--
gr/ACF	--
lb/hr	--
lb/ton of product	1.52

* Average of 32 tests.

Reference 5.

Table 9

FACILITY - B (Primary Outlet - Fluorides)

Summary of Results

Run number	1	2	3	Average
Date	5/15/72	5/12/72	5/16/72	-
Test Time-minutes	240	240	240	240
Production rate - TPH	0.441	0.441	0.441	0.441
Stack Effluent				
Flow rate - DSCFM	50,596	48,795	47,121	48,837
Flow rate - DSCF/ton	115,000	111,000	107,000	111,000
Temperature - ^{o}F	57.4	57.6	83.7	66.3
Water vapor - Vol. %	5.42	5.76	5.64	5.61
CO_2 - Vol. % dry	0.6	0.6	0.6	0.6
O_2 - Vol. % dry	20.2	20.2	20.2	20.2
CO - Vol. % dry	0.0	0.0	0.0	0.0
Visible Emissions - % opacity	10%	10%	10%	10%
Fluorides				
Soluble				
gr/DSCF	0.00040	0.00039	0.00046	0.00043
gr/ACF	0.00039	0.00031	0.00042	0.00038
lb/hr	0.174	0.162	0.186	0.174
lb/ton of product	0.394	0.365	0.422	0.394
Total Fluorides				
gr/DSCF	0.00042	0.00044	0.00046	0.00044
gr/ACF	0.00040	0.00033	0.00042	0.00038
lb/hr	0.181	0.169	0.186	0.179
lb/ton of product	0.410	0.382	0.422	0.405

Reference 6.

Table 10

FACILITY B_1 (Primary Outlet-Fluorides)

Summary of Results

	Range	Average
Run number		
Date	--	--
Test Time-minutes	--	--
Production rate - TPH	--	--
Stack Effluent		
Flow rate - DSCFM	--	--
Flow rate - DSCF/ton	--	--
Temperature - ^oF	--	--
Water vapor - Vol. %	--	
CO_2 - Vol. % dry	--	--
O_2 - Vol. % dry	--	--
CO - Vol. % dry	--	--
Visible Emissions - % opacity	--	--
Fluorides		
Soluble		
gr/DSCF	--	--
gr/ACF	--	--
lb/hr	--	--
lb/ton of product	--	--
Total Fluorides		
gr/DSCF	--	--
gr/ACF	--	--
lb/hr	--	--
lb/ton of product	0.43 to 0.62	0.50

Reference 7.

Table 11

FACILITY - B (Roof Emissions-Fluorides)

Summary of Results

Run Number	1	2	3	4	Average
Date	5/12/72	5/15/72	5/16/72	5/17/72	-
Test Time-minutes	1062	735	645	450	723
Production rate - TPH	2.64	2.64	2.64	2.64	2.64
Stack Effluent					
Flow rate - DSCFM	2,811,000	2,811,000	2,811,000	2,811,000	2,811,000
Flow rate - DSCF/ton	1,065,000	1,065,000	1,065,000	1,065,000	1,065,000
Temperature ^{o}F	75	70	70	65	89
Water vapor - Vol. %	0	0.87	0.95	0.64	0.62
CO_2 - Vol. % dry	0.7	0.7	0.7	0.7	0.7
O_2 - Vol. % dry	19.9	19.9	19.9	19.9	19.9
CO - Vol. % dry	0.0	0.0	0.0	0.0	0.0
Visible Emissions - % opacity	0	0	0	0	0
Fluorides					
Soluble					
gr/DSCF	0.00012	0.00021	0.00024	0.00030	0.00022
gr/ACF	0.00012	0.00021	0.00024	0.00030	0.00022
lb/hr	2.87	5.12	5.87	7.30	5.29
lb/ton of product	1.09	1.93	2.22	2.76	2.00
Total Fluorides					
gr/DSCF	0.00012	0.00022	0.00025	0.00031	0.00022
gr/ACF	0.00012	0.00022	0.00025	0.00031	0.00022
lb/hr	2.92	5.32	6.04	7.54	5.45
lb/ton of product	1.10	2.01	2.28	2.85	2.06

Reference 6.

Table 12

FACILITY B_1 (Roof Emissions-Fluorides)

Summary of Results

Run number	Range	Average
Date	--	--
Test Time-minutes	--	--
Production rate - TPH	--	--
Stack Effluent		
Flow rate - DSCFM	--	--
Flow rate - DSCF/ton	--	--
Temperature - ^oF	--	--
Water vapor - Vol. %	--	
CO_2 - Vol. % dry	--	--
O_2 - Vol. % dry	--	--
CO - Vol. % dry	--	--
Visible Emissions - % opacity	--	--
Fluorides		
Soluble		
gr/DSCF	--	--
gr/ACF	--	--
lb/hr	--	--
lb/ton of product	--	--
Total Fluorides		
gr/DSCF	--	--
gr/ACF	--	--
lb/hr	--	--
lb/ton of product	0.91 to 1.68	1.15

Reference 7.

Table 13

FACILITY - C (Primary Outlet - Fluorides)

Summary of Results

Run Number	1*	2	3	4*	Average
Date	5/1/72	5/2/72	5/3/72	5/4/72	-
Test Time-minutes	336	384	384	384	123.3
Production rate - TPH	0.122	0.123	0.124	0.124	123.3
Stack Effluent					
Flow rate - DSCFM	10,334	10,512	10,532	9,389	10,192
Flow rate - DSCF/ton	5,170,000	5,260,000	5,280,000	4,690,000	5,100,000
Temperature ^{o}F	192.2	179.1	176.1	181.0	182.1
Water vapor - Vol. %	0.00	0.00	0.33	0.49	0.21
CO_2 - Vol. % dry	0.0	0.0	0.0	0.0	0.0
O_2 - Vol. % dry	19.8	19.8	19.8	19.8	19.8
CO - Vol. % dry	0.6	0.6	0.6	0.6	0.6
Visible Emissions - % opacity	0	0	0	0	0
Fluorides					
Soluble					
gr/DSCF	0.000082	0.000365	0.00023	0.000084	0.000190
gr/ACF	0.000065	0.0000290	0.00019	0.000068	0.000153
lb/hr	0.00724	0.0321	0.0210	0.0068	0.0168
lb/ton of product	0.0592	0.260	0.168	0.055	0.135
Total Fluorides					
gr/DSCF	0.000092	0.000374	0.000230	0.000084	0.000195
gr/ACF	0.000073	0.000300	0.000190	0.000069	0.000158
lb/hr	0.00814	0.0329	0.0210	0.00068	0.0172
lb/ton of product	0.0667	0.267	0.168	0.055	0.139

* Deleted from use in standard data.

Reference 8.

Table 14

FACILITY - C (Roof Emissions - Fluorides)

Summary of Results

Run Number	1	2	3	4	Average
Date	5/1/72	5/2/72	5/3/72	5/4-5/72	-
Test Time-minutes	565	1229	1377	1350	1130
Production rate - TPH	3.72	3.72	3.72	3.72	3.70
Stack Effluent					
Flow rate - DSCFM	1,403,000	1,551,000	1,407,000	1,492,000	2,362,500
Flow rate - DSCF/ton	2,265,000	2,500,000	2,275,000	2,410,000	1,463,250
Temperature ^{o}F	84.7	91.7	106.3	106.5	97.3
Water vapor - Vol. %	0.00	0.00	0.291	0.110	0.10
CO_2 - Vol. % dry	0.4	0.4	0.4	0.4	0.4
O_2 - Vol. % dry	20.6	20.6	20.6	20.6	20.6
CO - Vol. % dry	0.0	0.0	0.0	0.0	0.0
Visible Emissions - % opacity	0	0	0	0	0
Fluorides					
Soluble					
gr/DSCF	0.000173	0.000188	0.00186	0.000158	0.000176
gr/ACF	0.000166	0.000178	0.000171	0.000146	0.000165
lb/hr	2.075	2.492	2.244	2.022	2.208
lb/ton of product	1.12	1.34	1.21	1.09	1.19
Total Fluorides					
gr/DSCF	0.000173	0.000191	0.000188	0.000160	0.000178
gr/ACF	0.000166	0.000181	0.000174	0.000148	0.000167
lb/hr	2.075	2.542	2.284	2.050	2.238
lb/ton of product	1.12	1.37	1.23	1.10	1.20

Reference 8.

Table 15

FACILITY - D (Primary Outlet - Fluorides)

Summary of Results

Run number	1	2*	3*	Average
Date	2/29/72	3/1/72	3/1/72	-
Test Time-minutes	192	192	192	192
Production rate - TPH	0.449	0.449	0.449	0.449
Stack Effluent				
Flow rate - DSCFM	19,579	18,162	19,711	19,150
Flow rate - DSCF/ton	43,650	44,850	43,950	44,150
Temperature - °F	239	228	237	234
Water vapor - Vol. %	0.514	1.358	1.36	1.08
CO_2 - Vol. % dry	3.40	3.40	3.4	3.4
O_2 - Vol. % dry	16.3	16.3	16.3	16.3
CO - Vol. % dry	0.3	0.3	0.3	0.3
Visible Emissions - % opacity	0	0	0	0
Fluorides				
Soluble				
gr/DSCF	0.0015	0.0042	0.0042	0.0033
gr/ACF	0.0011	0.0031	0.0031	0.0024
lb/hr	0.252	0.720	0.234	0.402
lb/ton of product	0.561	1.560	1.560	1.23
Total Fluorides				
gr/DSCF	0.0016	0.0043	0.0043	0.0034
gr/ACF	0.0012	0.0032	0.0031	0.0025
lb/hr	0.276	0.744	0.240	0.42
lb/ton of product	0.612	1.656	1.602	1.29

* Operator experienced feed control problems this date. Malfunction corrected before next test. This data questionable and deleted from use in standard data.

Table 15 (Continued)

FACILITY - D (Primary Outlet - Fluorides)

Summary of Results

Run number	4	5	6	Average
Date	3/2/72	3/2/72	3/3/72	-
Test Time-minutes	192	192	192	192
Production rate - TPH	0.449	0.449	0.449	0.449
Stack Effluent				
Flow rate - DSCFM	19,313	20,976	19,598	19,962
Flow rate - DSCF/ton	43,050	46,650	43,800	44,500
Temperature - ^{o}F	233	235	225	231
Water vapor - Vol. %	1.54	0.97	1.31	1.28
CO_2 - Vol. % dry	3.4	3.4	3.4	3.4
O_2 - Vol. % dry	16.3	16.3	16.3	16.3
CO - Vol. % dry	0.3	0.3	0.3	0.3
Visible Emissions - % opacity	0	0	0	0
Fluorides				
Soluble				
gr/DSCF	0.0013	0.0012	0.0008	0.0011
gr/ACF	0.0010	0.0009	0.0006	0.0008
lb/hr	0.072	0.072	0.135	0.093
lb/ton of product	0.483	0.477	0.297	0.419
Total Fluorides				
gr/DSCF	0.0014	0.0013	0.007	0.0011
gr/ACF	0.0010	0.0009	0.0007	0.0008
lb/hr	0.078	0.075	0.147	0.100
lb/ton of product	0.519	0.504	0.321	0.448

Reference 9.

Table 16

FACILITY - D_1 (Primary Outlet - Fluorides)

Summary of Results

Run number	1	2	3	Average
Date	3/6/72	3/7/72	3/7/72	-
Test Time-minutes	192	192	192	192
Production rate - TPH	0.449	0.449	0.449	0.449
Stack Effluent				
Flow rate - DSCFM	19,671.3	18,868.2	18,903.00	19,147.00
Flow rate - DSCF/ton	43,800	42,000	42,150	42,650
Temperature - ^{o}F	209.8	216.3	221.3	215.8
Water vapor - Vol. %	0.374	0.353	0.700	0.476
CO_2 - Vol. % dry	3.4	3.4	3.4	3.4
O_2 - Vol. % dry	16.3	16.3	16.3	16.3
CO - Vol. % dry	0.3	0.3	0.3	0.3
Visible Emissions - % opacity	0	0	0	0
Fluorides				
Soluble				
gr/DSCF	0.0012	0.0009	0.0011	0.0011
gr/ACF	0.0009	0.0007	0.0008	0.0008
lb/hr	0.1998	0.1506	0.1761	0.1755
lb/ton of product	0.484	0.336	0.393	0.404
Total Fluorides				
gr/DSCF	0.0013	0.0011	0.0012	0.0012
gr/ACF	0.0010	0.0008	0.0009	0.0009
lb/hr	0.2223	0.1710	0.1968	0.1967
lb/ton of product	0.495	0.381	0.438	0.438

Reference 9.

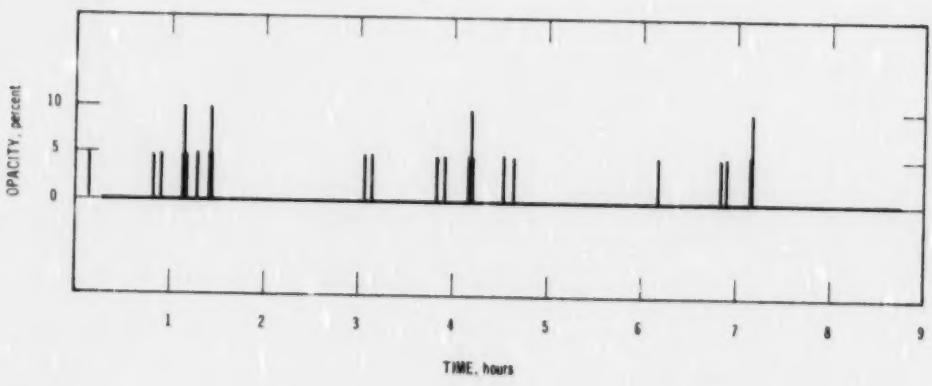
Table 17
FACILITY D
SUMMARY OF VISIBLE EMISSIONS

Date:	2/20/74		
Type of Plant:	Primary Aluminum Plant (Potroom Facility)		
Type of Discharge:	stacks (14)	Distance from Observer to Discharge Point:	150 ft.
Location of Discharge:	Top of baghouse	Height of Observation Point:	ground level
Height of Point of Discharge:	50 ft.	Direction of Observer from Discharge Point:	SE
Description of Background:	sky		
Description of Sky:	clear		
Wind Direction:	SSW	Wind Velocity:	5 mi/hr
Color of Plume:	white	Detached Plume:	no
Interference of Steam Plume:	none		
Duration of Observation:	9 hours		

Summary of Data:

Opacity, Percent	Total Time Equal to or Greater Than Given Opacity		Opacity, Percent	Total Time Equal to or Greater Than Given Opacity	
	Min.	Sec.		Min.	Sec.
5	24	45	55	-	-
10	2	15	60	-	-
15	0	0	65	-	-
20	-	-	70	-	-
25	-	-	75	-	-
30	-	-	80	-	-
35	-	-	85	-	-
40	-	-	90	-	-
45	-	-	95	-	-
50	-	-	100	-	-

Sketch Showing How Opacity Varied With Time:(1)



(1) High points come from one stack out of the 14 and during periods when rapping was occurring.

Reference 10.

Table 18

FACILITY D

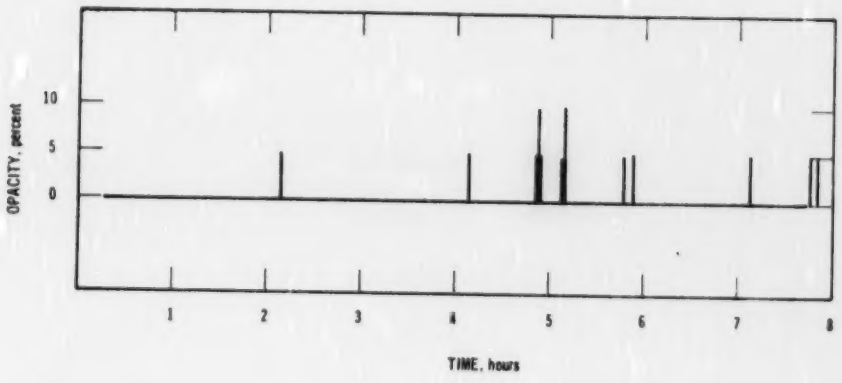
SUMMARY OF VISIBLE EMISSIONS

Date:	2/21/74		
Type of Plant:	Primary Aluminum plant (Potroom Facilities)		
Type of Discharge:	stacks (14)	Distance from Observer to Discharge Point:	150 ft.
Location of Discharge:	top of baghouse	Height of Observation Point:	ground level
Height of Point of Discharge:	50 ft.	Direction of Observer from Discharge Point:	SE
Description of Background:	sky		
Description of Sky:	clear		
Wind Direction:	NNE	Wind Velocity:	10-15 mi/hr
Color of Plume:	white	Detached Plume:	no
Interference of Steam Plume:	none		
Duration of Observation:	8 hours		

Summary of Data:

Opacity, Percent	Total Time Equal to or Greater Than Given Opacity		Opacity, Percent	Total Time Equal to or Greater Than Given Opacity	
	Min.	Sec.		Min.	Sec.
5	9	15	55	-	-
10	1	30	60	-	-
15	0	0	65	-	-
20	-	-	70	-	-
25	-	-	75	-	-
30	-	-	80	-	-
35	-	-	85	-	-
40	-	-	90	-	-
45	-	-	95	-	-
50	-	-	100	-	-

Sketch Showing How Opacity Varied With Time: (1)



(1) High points come from one stack out of the 14 stacks and during the period when rapping was occurring.

Reference 10.

Table 19

FACILITY - D (Roof Emissions-Fluorides)

Summary of Results

Run number	1	2	3	Average
Date	3/1-2/72	3/2-3/72		-
Test Time-minutes	1441	1200		1320.5
Production rate - TPH	1.740	1.740		1.740
Stack Effluent				
Flow rate - DSCFM	(665,310)	(754,152)		709,731
Flow rate - DSCF/ton	382,000	433,000		407,500
Temperature - ^{o}F	105.9	103.5		104.7
Water vapor - Vol. %	0.0	0.0		0.0
CO_2 - Vol. % dry	1.8	1.8		1.8
O_2 - Vol. % dry	20.8	20.8		20.8
CO - Vol. % dry	0.8	0.8		0.8
Visible Emissions - % opacity	0	0		0
Fluorides				
Soluble				
gr/DSCF	0.00022	0.00036		0.00029
gr/ACF	0.00020	0.00033		0.00027
lb/hr	1.28	2.32		1.80
lb/ton of product	0.73	1.33		1.03
Total Fluorides				
gr/DSCF	0.00026	0.00040		0.00033
gr/ACF	0.00024	0.00036		0.00030
lb/hr	1.50	2.57		2.04
lb/ton of product	0.86	1.48		1.17

Reference 9.

Table 20

FACILITY D

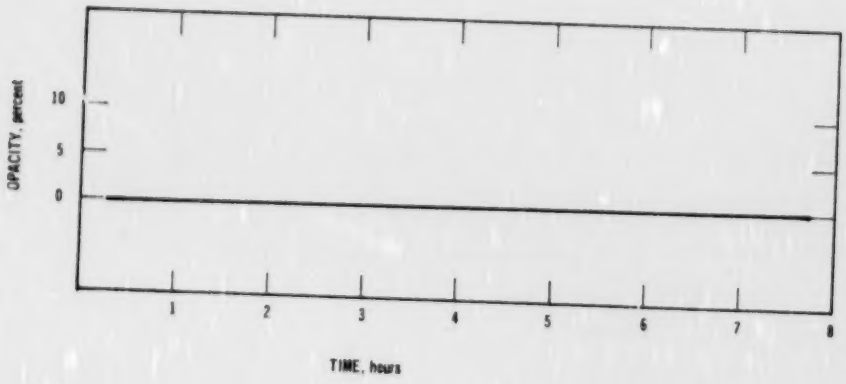
SUMMARY OF VISIBLE EMISSIONS

Date:	2/21/74		
Type of Plant:	Primary Aluminum plant (Potroom Facility)		
Type of Discharge:	Monitor	Distance from Observer to Discharge Point:	160 ft.
Location of Discharge:	Roof of potroom	Height of Observation Point:	ground level
Height of Point of Discharge:	60 ft.	Direction of Observer from Discharge Point:	southeast
Description of Background:	sky		
Description of Sky:	clear		
Wind Direction:	NNE	Wind Velocity:	10-15 mi/hr
Color of Plume:	-	Detached Plume:	no
Interference of Steam Plume:	none		
Duration of Observation:	8 hours		

Summary of Data:

Opacity, Percent	Total Time Equal to or Greater Than Given Opacity Min.	Sec.	Opacity, Percent	Total Time Equal to or Greater Than Given Opacity Min.	Sec.
5	Visible emissions were consistently zero percent opacity.		55		
10			60		
15			65		
20			70		
25			75		
30			80		
35			85		
40			90		
45			95		
50			100		

Sketch Showing How Opacity Varied With Time:



Reference 10.

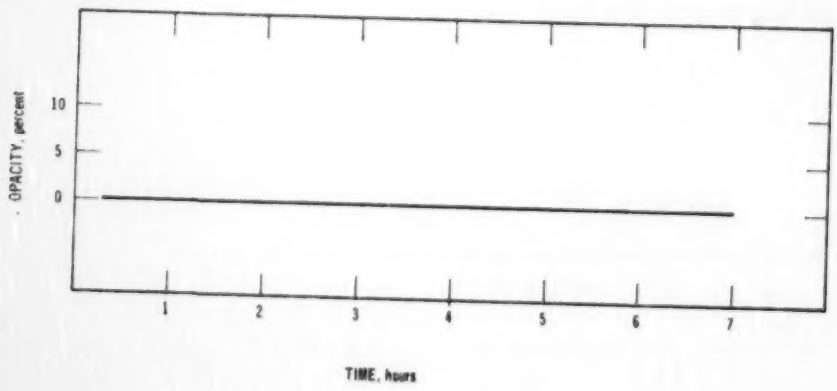
Table 21
FACILITY D
SUMMARY OF VISIBLE EMISSIONS

Date:	2/20/74		
Type of Plant:	Primary Aluminum plant (Potroom Facility)		
Type of Discharge:	Monitor	Distance from Observer to Discharge Point:	160 ft.
Location of Discharge:	roof of potroom	Height of Observation Point:	ground level
Height of Point of Discharge:	60 ft.	Direction of Observer from Discharge Point:	southeast
Description of Background:	sky		
Description of Sky:	clear		
Wind Direction:	NNW	Wind Velocity:	5-10 mi/hr
Color of Plume:	-	Detached Plume:	no
Interference of Steam Plume:	none		
Duration of Observation:	7 hours		

Summary of Data:

Opacity, Percent	Total Time Equal to or Greater Than Given Opacity Min.	Sec.	Opacity, Percent	Total Time Equal to or Greater Than Given Opacity Min.	Sec.
5	Visible emissions were consistently zero percent opacity.		55		
10			60		
15			65		
20			70		
25			75		
30			80		
35			85		
40			90		
45			95		
50			100		

Sketch Showing How Opacity Varied With Time:



Reference 10.

Table 22

FACILITY E (Primary Outlet-Fluorides)

Summary of Results

Run number	Range of Data*	Average
Date	--	--
Test Time-minutes	--	--
Production rate - TPH	--	--
Stack Effluent		
Flow rate - DSCFM	--	--
Flow rate - DSCF/ton	--	--
Temperature - ^{o}F	--	--
Water vapor - Vol. %	--	--
CO_2 - Vol. % dry	--	--
O_2 - Vol. % dry	--	--
CO - Vol. % dry	--	--
Visible Emissions - % opacity	--	--
Fluorides		
Soluble		
gr/DSCF	--	--
gr/ACF	--	--
lb/hr	--	--
lb/ton of product	--	--
Total Fluorides		
gr/DSCF	--	--
gr/ACF	--	--
lb/hr	--	--
lb/ton of product	0.2 to 1.0	0.51

* 14 data points from tests at 2 plants.

Reference 11.

Table 23

FACILITY E (Roof Emissions-Fluorides)

Summary of Results

Run number	Range of Data*	Average
Date	Mid 1971 to Mid 1972	--
Test Time-minutes	--	--
Production rate - TPH	--	--
Stack Effluent		
Flow rate - DSCFM	--	--
Flow rate - DSCF/ton	--	--
Temperature - ^{o}F	--	--
Water vapor - Vol. %	--	--
CO_2 - Vol. % dry	--	--
O_2 - Vol. % dry	--	--
CO - Vol. % dry	--	--
Visible Emissions - % opacity	--	--
Fluorides		
Soluble		
gr/DSCF	--	--
gr/ACF	--	--
lb/hr	--	--
lb/ton of product	--	--
Total Fluorides		
gr/DSCF	--	--
gr/ACF	--	--
lb/hr	--	--
lb/ton of product	0.83 to 1.31	1.14

* 7 data points from tests at 2 plants. A high value of 4.40 lb/ton of product was deleted.

Reference 11.

Table 24

FACILITY F (Primary Outlet-Fluorides)

Summary of Results

Run number	1
Date	6/27/72
Test Time-minutes	--
Production rate - TPH	3.14
Stack Effluent	
Flow rate - DSCFM	--
Flow rate - DSCF/ton	--
Temperature - ^{o}F	--
Water vapor - Vol. %	--
CO_2 - Vol. % dry	--
O_2 - Vol. % dry	--
CO - Vol. % dry	--
Visible Emissions - % opacity	--
Fluorides	
Soluble	
gr/DSCF	--
gr/ACF	--
lb/hr	--
lb/ton of product	--
Total Fluorides	
gr/DSCF	--
gr/ACF	0.0009
lb/hr	0.13
lb/ton of product	0.04

Reference 12.

Table 25

FACILITY G (Primary Outlet-Fluorides)

Summary of Results*

	Average
Run number	--
Date	--
Test Time-minutes	--
Production rate - TPH	--
Stack Effluent	
Flow rate - DSCFM	--
Flow rate - DSCF/ton	--
Temperature - ^{o}F	--
Water vapor - Vol. %	
CO_2 - Vol. % dry	--
O_2 - Vol. % dry	--
CO - Vol. % dry	--
Visible Emissions - % opacity	--
Fluorides	
Soluble	
gr/DSCF	--
gr/ACF	--
lb/hr	--
lb/ton of product	--
Total Fluorides	
gr/DSCF	--
gr/ACF	--
lb/hr	7.3
lb/ton of product	0.74

* Average of tests over 1 1/2 years.

References 12 and 13.

Table 26

FACILITY G (Roof Emissions-Fluorides)

Summary of Results

	Average*
Run number	--
Date	--
Test Time-minutes	--
Production rate - TPH	--
Stack Effluent	
Flow rate - DSCFM	--
Flow rate - DSCF/ton	--
Temperature - ^{o}F	--
Water vapor - Vol. %	--
CO_2 - Vol. % dry	--
O_2 - Vol. % dry	--
CO - Vol. % dry	--
Visible Emissions - % opacity	--
Fluorides	
Soluble	
gr/DSCF	--
gr/ACF	--
lb/hr	--
lb/ton of product	--
Total Fluorides	
gr/DSCF	--
gr/ACF	--
lb/hr	11.7
lb/ton of product	1.18

* Average of tests over 1 1/2 years.

References 12 and 13.

Table 27

FACILITY H (Primary Outlet-Fluorides)

Summary of Results

Run number	Average*
Date	--
Test Time-minutes	--
Production rate - TPH	--
Stack Effluent	
Flow rate - DSCFM	--
Flow rate - DSCF/ton	--
Temperature - ^{o}F	--
Water vapor - Vol. %	--
CO_2 - Vol. % dry	--
O_2 - Vol. % dry	--
CO - Vol. % dry	--
Visible Emissions - % opacity	--
Fluorides	
Soluble	
gr/DSCF	--
gr/ACF	--
lb/hr	--
lb/ton of product	--
Total Fluorides	
gr/DSCF	--
gr/ACF	--
lb/hr	--
lb/ton of product	0.31

* Average over a 6-month period.

Reference 14.

Table 28

FACILITY H (Secondary Outlet-Fluorides)

Summary of Results

	Average*
Run number	
Date	--
Test Time-minutes	--
Production rate - TPH	--
Stack Effluent	
Flow rate - DSCFM	--
Flow rate - DSCF/ton	--
Temperature - ^{o}F	--
Water vapor - Vol. %	--
CO_2 - Vol. % dry	--
O_2 - Vol. % dry	--
CO - Vol. % dry	--
Visible Emissions - % opacity	--
Fluorides	
Soluble	
gr/DSCF	--
gr/ACF	--
lb/hr	--
lb/ton of product	--
Total Fluorides	
gr/DSCF	--
gr/ACF	--
lb/hr	--
lb/ton of product	1.18

* Average for 18 months of continuous sampling.

Reference 14.

ANODE BAKE FURNACE

DATA

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Table 29

FACILITY - A (Anode Furnace-Fluorides)

Summary of Results

Run number	1	2	3	Average
Date	6/20/72	6/21/72	6/21/72	-
Test Time-minutes	224	140	140	168
Production rate - TPH (Anode)	9.1	9.1	9.1	9.1
Stack Effluent				
Flow rate - DSCFM	38,830	44,620	37,060	39,503
Flow rate - DSCF/ton	2,930	3,550	2,950	3,143
Temperature - ^{o}F	117.3	125.2	125.1	122.5
Water vapor - Vol. %	7.52	7.36	6.46	7.11
CO_2 - Vol. % dry	0.66	0.66	0.66	0.66
O_2 - Vol. % dry	14.3	14.3	14.3	14.3
CO - Vol. % dry	1.6	1.6	1.6	1.6
Visible Emissions - % opacity	20	20	20	20
Fluorides				
Soluble				
gr/DSCF	0.0182	0.0211	0.0206	0.0200
gr/ACF	0.0150	0.0173	0.0170	0.0164
lb/hr	5.75	8.06	6.54	6.78
lb/ton of anode	0.63	0.89	0.72	0.74
Total Fluorides				
gr/DSCF	0.0201	0.0221	0.0216	0.0213
gr/ACF	0.0166	0.0183	0.0179	0.0176
lb/hr	6.35	8.69	8.87	7.97
lb/ton of anode	0.70	0.96	0.98	0.88

Reference 15.

Table 30

FACILITY A

SUMMARY OF VISIBLE EMISSIONS

Date:	2/25/74		
Type of Plant:	Carbon Anode Bake Plant		
Type of Discharge:	stack	Distance from Observer to Discharge Point:	250 ft.
Location of Discharge:	top of stack	Height of Observation Point:	ground level
Height of Point of Discharge:	181 ft.	Direction of Observer from Discharge Point:	North
Description of Background:	sky		

Description of Sky: The sky was clear except for billowy white to gray clouds periodically crossing the sky.

Wind Direction:	W-WNW	Wind Velocity:	8-10	mi/hr
Color of Plume:	white	Detached Plume:	no	

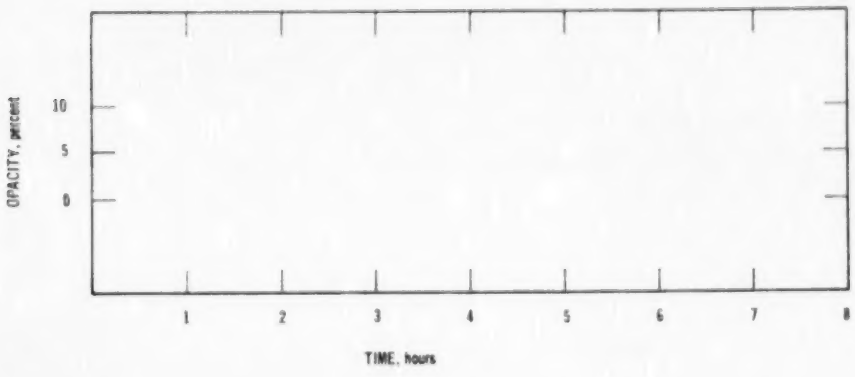
Interference of Steam Plume: yes, steam plume occurs at about 45°F. The high was 27°F.

Duration of Observation: 8 hours

Summary of Data:

Opacity, Percent	Total Time Equal to or Greater Than Given Opacity		Opacity, Percent	Total Time Equal to or Greater Than Given Opacity	
	Min.	Sec.		Min.	Sec.
5	480	0	55	-	-
10	0	0	60	-	-
15	-	-	65	-	-
20	-	-	70	-	-
25	-	-	75	-	-
30	-	-	80	-	-
35	-	-	85	-	-
40	-	-	90	-	-
45	-	-	95	-	-
50	-	-	100	-	-

Sketch Showing How Opacity Varied With Time:



Reference 16.

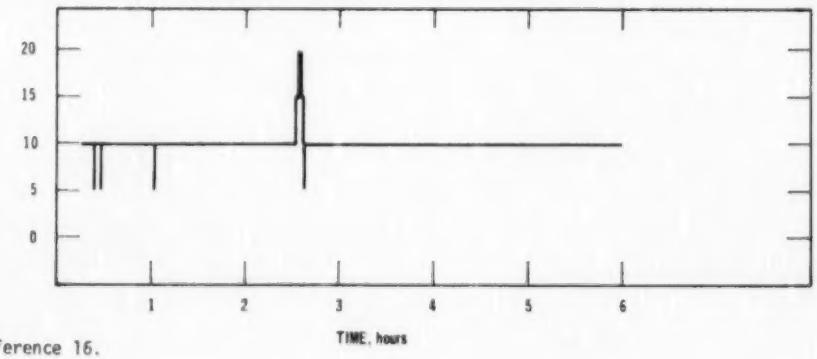
Table 31
FACILITY A
SUMMARY OF VISIBLE EMISSIONS

Date:	2/26/74		
Type of Plant:	Carbon Anode Bake Plant		
Type of Discharge:	stack	Distance from Observer to Discharge Point:	250 ft.
Location of Discharge:	top of stack	Height of Observation Point:	ground level
Height of Point of Discharge:	181 ft.	Direction of Observer from Discharge Point:	east
Description of Background:	sky		
Description of Sky:	clear		
Wind Direction:	N-NNW	Wind Velocity:	2-4 mi/hr
Color of Plume:	white to tan	Detached Plume:	no
Interference of Steam Plume:	yes		
Duration of Observation:	6 hrs.		

Summary of Data:

Opacity, Percent	Total Time Equal to or Greater Than Given Opacity		Opacity, Percent	Total Time Equal to or Greater Than Given Opacity	
	Min.	Sec.		Min.	Sec.
5	360	0	55	-	-
10	351	0	60	-	-
15	353	0	65	-	-
20	2	0	70	-	-
25	0	-	75	-	-
30	-	-	80	-	-
35	-	-	85	-	-
40	-	-	90	-	-
45	-	-	95	-	-
50	-	-	100	-	-

Sketch Showing How Opacity Varied With Time:



Reference 16.

Table 32

FACILITY - B (Anode Furnace-Fluorides)

Summary of Results

Run number	1	2	3	Average
Date	10/19/72	10/19/72	10/20/72	-
Test Time-minutes	240	240	240	240
Production rate - TPH (Anode)	13.15	13.15	13.15	13.15
Stack Effluent				
Flow rate - DSCFM	75,774	72,460	70,340	72,858
Flow rate - DSCF/ton	5,762	5,510	5,349	5,540
Temperature - ^{o}F	196	215	206	
Water vapor - Vol. %	3.5	3.7	3.2	3.5
CO_2 - Vol. % dry	1.1	1.1	1.1 *	1.1
O_2 - Vol. % dry	19.1	19.1	19.1 *	19.1
CO - Vol. % dry	0.0	0.0	0.0 *	0.0
Visible Emissions - % opacity	10-20%	10-20%	10-20%	10-20%
Fluorides				
Soluble				
gr/DSCF	-	-	-	-
gr/ACF	-	-	-	-
lb/hr	-	-	-	-
lb/ton	-	-	-	-
Total Fluorides				
gr/DSCF	0.02555	0.02708	0.02605	0.02627
gr/ACF	0.02002	0.02056	0.02027	0.02019
lb/hr	16.58	16.81	15.69	16.36
lb/ton of anode	1.26	1.28	1.20	1.25

* ORSAT analyzer was not operating properly. This data questionable.

Reference 17.

REFERENCES

Aluminum Reduction Facilities

1. Joint Emission Test Report, October 24, 1972, EPA and Valentine, Fisher, and Tomlinson, Contract No. 68-02-0236, EMB Test No. 72-MM-07.

2. Joint Emission Test Report, EPA and Valentine, Fisher, and Tomlinson, Contract No. 68-02-0236, EMB Test No. 73-ALR-1.

3. Memo and attachments from David J. Lutrick, EPA Region X, to Reid E. Iversen, EPA, Applied Technology Division, June 9, 1972.

4. "Emissions from the Wet Scrubber System at [Plant A]," June 7, 1972, prepared for EPA by York Research Corporation, EMB Test No. 71-MM-21.

5. Data submitted to EPA by the owner of Plant A.

6. Joint Emission Test Report, EPA and Valentine, Fisher, and Tomlinson, Contract No. 68-02-0236, EMB Test No. 72-MM-08.

7. Letter from a Division Engineer of the company operating Plant B to Reid Iversen, EPA, October 18, 1972.

8. Joint Emission Test Report, October 24, 1972, EPA and Valentine, Fisher, and Tomlinson, Contract No. 68-02-0236, EMB Test No. 72-MM-06.

9. EPA Emission Testing Report No. 72-MM-12.

10. Iversen, Reid E., EPA, "Trip Report to [Plant D]" and attachments, March 5, 1974.

11. Letter from a Vice President of the company operating Plants C and D to Reid Iversen, EPA, September 15, 1972.

12. Pfaff, Roger O., EPA, International Trip Report and attachments, September 21, 1972.

13. Data supplied to EPA by the owner of Plant G.

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Anode Bake Furnaces

15. EPA Emission Test Report No. 72-MM-24.

16. Iversen, Reid E., EPA, "Trip Report to [Anode Facility B]" and attachments, March 5, 1974.

17. Emission Test Report, January 29, 1973, prepared for EPA by Midwest Research Institute, Contract No. 68-02-0228, EMB Test No. 73-ALR-3.

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16. ABSTRACT

This volume is the second of a series on standards of performance for primary aluminum plants. This volume presents a summary of source tests and visible emission measurements cited in Volume 1. It is concerned principally with tests for fluorides and visible emissions, but also describes the facilities from which data have been obtained, their operating conditions, and characteristics of exhaust gas streams.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air pollution Pollution control Performance standards Primary Aluminum Plants	Air pollution control	

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